

Review of the ichthyofaunal changes in Lake Eğirdir between 1915 and 2007

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Abstract: The ichthyofaunal changes in Lake Eğirdir between 1915 and 2007 were reviewed. It was understood that the most drastic change in the ichthyofauna of Lake Eğirdir occurred in 1955 with the introduction of pike-perch (*Sander lucioperca*), and that the process of change continued with the addition of Prussian carp (*Carassius gibelio*) in 1996 and big scale sand smelt (*Atherina boyeri*) in 2003. Today, there are 15 fish taxa (10 native, 5 non-native) in Lake Eğirdir. It was determined that, among the endemic species of Lake Eğirdir, Handlirsch's minnow (*Pseudophoxinus handlirschi*) is extinct (EX), Ereğli minnow (*Hemigrammocapoeta kemali*) disappeared, and Eğirdir minnow (*Pseudophoxinus egridiri*) and Eğirdir barb (*Capoeta pestai*) are critically endangered (CR).

Key words: Lake Eğirdir, ichthyofauna, taxonomy, non-native species

Eğirdir Gölü'ndeki ihtiyofaunal değişimler: 1915–2007

Özet: Bu çalışmada, 1915–2007 yılları arasında Eğirdir Gölü balık faunasındaki değişimler değerlendirilmiştir. Eğirdir Gölü balık faunasındaki en köklü değişimin 1955 yılında sudağın (*Sander lucioperca*) aşılması ile gerçekleştiği, 1996 yılında gümüşü havuz balığı (*Carassius gibelio*) ve 2003 yılında gümüş balığının (*Atherina boyeri*) da eklenmesiyle değişim sürecinin devam etmekte olduğu anlaşılmıştır. Günümüzde, Eğirdir Gölü'nde 15 balık taksonu (10'u yerli 5'i yabancı) bulunmaktadır. Gölün endemik türlerinden Kavinne (*Pseudophoxinus handlirschi*)'nin neslinin tükendiği (EX), Ereğli sazani (*Hemigrammocapoeta kemali*)'nin yok olduğu, Eğirdir otsazanı (*Pseudophoxinus egridiri*) ve Eğirdir bıyıklısı (*Capoeta pestai*)'nin ise kritik düzeyde (CR) bulunduğu belirlenmiştir.

Anahtar sözcükler: Eğirdir Gölü, Balık faunası, taksonomi, yabancı tür

Introduction

The Anatolian Plateau is composed of 5 geological units, namely Kırşehir, the Pontides, Sakarya continent, and the Menderes-Taurus and East Taurus blocks (Görür et al., 1984; Hrbek et al., 2002). These geological blocks were also suggested to have had significant impact on the formation of the

phylogenetic clades (Hrbek et al., 2002). The accuracy of this theory has also been studied, especially through the phylogenetic relationships of endemic terrestrial and freshwater animals. In recent years, the results of genetic studies carried out on the species of *Aphanius* (Cyprinodontidae) and *Pseudophoxinus* (Cyprinidae), which inhabit similar limnetic habitats

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of Turkey, have increased the accuracy of this theory (Hrbek et al., 2002, 2004).

Lake Eğirdir was formed as a result of a subsidence located in the intersection area of the Menderes-Taurus and East Taurus blocks of the Central Anatolian Plateau. The first signs of the formation of this lake can be traced to the Upper Cretaceous (Mesozoic-Tertiary, 65 million years ago) period, and the current sediment remains hold traces of the Plio-Quaternary period (2 Mya–10 Kya) (Görmüş et al., 2005). Therefore, the central Anatolian Plateau has a high rate of endemism.

Ichthyofaunal changes in Lake Eğirdir were not given in detail in studies carried out by Battalgil (1942, 1944), Kosswig and Geldiay (1952), Kosswig and Sözer (1945), Ladiges (1960), Banarescu (1977), Balık (1988), Küçük (1998), or Van Neer et al. (1999).

The absence of comparative material with respect to freshwater fish in Turkish museums until recent years is an important source of taxonomic problems, frequently leading to misidentifications.

In the first study of Lake Eğirdir, which was carried out by Pietschmann (1933), 3 species of Cyprinidae were identified: *Acanthorutilus handlirschi* (*Pseudophoxinus handlirschi*), *Varicorhinus pestai* (*Capoeta pestai*), and *Schizothorax prophylax* (*C. pestai*). Kosswig and Geldiay (1952) studied the fish fauna of the lake and listed 10 species (7 species of Cyprinidae, 2 species of Cobitidae, and 1 species of Cyprinodontidae). In addition, Numann (1958) reported fish species and hunting activity in Lake Eğirdir. After the introduction of *Sander lucioperca*, which was brought from Austria in 1955, the balance of the fauna rapidly collapsed. Consequently, this led to the elimination of *P. handlirschi*, an endemic of the lake, as early as the beginning of the 1970s, as well as the Anatolian endemic *Hemigrammocapoeta kemali* (*Tylognathus klatti*).

The first major change to the natural fish fauna in Lake Eğirdir began in 1955 with the intentional introduction of *Sander lucioperca*, an alien piscivorous fish. Then, omnivorous fish *Carassius gibelio* in 1996 and planktivorous-carnivorous *Atherina boyeri* in 2003 were introduced to lake through unknown methods. The native fish fauna changed greatly due to alien fish introductions and overfishing.

Accordingly, a re-evaluation of the ichthyofauna of the Lake Eğirdir became a necessity in light of the revisions in Anatolian fish fauna in recent years.

The present study aimed to determine the ichthyofaunal changes in Lake Eğirdir since the non-scientific records of Devעיyan (1915) to the present day. In this context the results of various studies carried out prior to 1998 were reviewed. Data obtained between 1998 and 2007 include the experiences of local fishermen, as well as sampling and monitoring by the authors.

Materials and methods

Meristic characters, such as number of gill rakers, pharyngeal teeth, dorsal and anal fin rays, lateral line scales, and vertebrae, were determined under a stereomicroscope. The last 2 branched dorsal and anal fins were counted as “1½” for Cyprinidae (Kottelat and Barbieri, 2004). The number of vertebrae was determined by radiography.

The Museum of Ege University Fisheries Faculty Inland Water Fish Collection (ESFM-PISI) and the Special Collection of Fahrettin Küçük-Süleyman Demirel University Eğirdir Fisheries Faculty (SCFK-SDU), preserved mainly in ethyl alcohol, were examined. For genus and species identification the following sources were referenced: Bogutskaya (1992, 1997), Karaman (1969, 1971, 1972), and Ladiges (1960) for the Cyprinidae; Wildekamp et al. (1999) for the Cyprinodontidae; Erkan et al. (1999) for the Cobitidae, Erkan et al. (2007) for the Balitoridae; and Ahnelt (1995) and Ahnelt et al. (1995) for the Gobiidae. The nomenclature used herein is based on the checklists of Eschmeyer (2006) and on the nomenclature used in Fish Base (Froese and Pauly, 2007).

Results

Native Ichthyofauna of Lake Eğirdir

Family: Cyprinidae

Cyprinus carpio L., 1758 (Common carp, sazan)

C. carpio Kosswig and Geldiay 1952, Numann 1958, Balık et al. 2006: Lake Eğirdir.

Material examined: 3 specimens in SCFK-SDU/0382 Lake Eğirdir (SL: 186-320 mm).

Diagnostic characters: D III 18-21^{1/2}; A III 5^{1/2}; lateral line 36-39; gill rakers 26-30; Pharyngeal teeth 1.1.3- 3.1.1; vertebrae 36-37.

Recorded by Deveciyan (1915), and Kosswig and Geldiay (1952). Today, the density has decreased because of overexploitation, habitat loss, and adverse effects of exotic species. Efficient fishing of this species is not performed.

***Capoeta pestai* (Pietschmann, 1933)** (Figure 1) (Eğirdir barb, Eğirdir bıyıklısı)

Varicorhinus pestai Pietschmann 1933, *Schizothorax prophyllax* Pietschmann 1933, *V. pestai* Kosswig and Geldiay 1952, *V. pestai* and *S. prophyllax* Numann 1958, *C. pestai* Balık et al. 2006: Lake Eğirdir; *C. pestai* Küçük, Turna and Demir 2007: Lake Eğirdir and Çayköy Canal-Eğirdir.

Material examined: 5 specimens in SCFK-SDU/0260 Lake Eğirdir (SL: 245.5-270 mm); 9 specimens in SCFK-SDU/0250 Çayköy Canal, Eğirdir (SL: 107.4-173 mm).

Diagnostic characters: D IV (V) 8^{1/2}; A III 5^{1/2}; lateral line 86-89; scales between dorsal fin origin and lateral line 16-18; scales between anal-fin origin and lateral line 9-11; gill rakers 15-16; pharyngeal teeth 2.3.5-5.3.2.

It was reported as “Eğirdir barb and Eğirdir bıyıklısı” in the original description by Deveciyan (1915). In the original definition, Pietschman (1933) reported it as 2 separate species—*Varicorhinus pestai* and *Schizothorax prophyllax*—regarding the variation in size, color, and spots, and external morphological differences due to sexual dimorphism. Nonetheless, the mouth shape, singular barbel, number of scales on the lateral line, and less than 20 scales between the dorsal fin origin-lateral line characters in the



Figure 1. *C. pestai* SCFK-SDU/0260 Lake Eğirdir (SL: 270 mm, female).

specimens from Eğirdir Lake (SCFK-SDU/0260) and Çayköy Canal (SCFK-SDU/0250) show basic characters that differentiate the genus *Capoeta* from *Schizothorax* (Coad, 2008). The population has declined to CR levels due to predation pressure by *Sander lucioperca*, introduced in 1955; however, more recently (between 2005 and 2007) it has begun to increase after the disappearance of *S. lucioperca* predation pressure.

***Hemigrammocapoeta kemali* (Hanko, 1924)** (Figure 2) (Ereğli minnow, Ereğli sazanı)

H. kemali turcicus Hanko 1924, *H. kemali* Pellegrin 1928: Akgöl-Ereğli; *H. kemali* Battalgil 1944: Lake Gölcük-Isparta; *Thylognathus (Neotylognathus) klatti* Kosswig 1950, *T. klatti* Kosswig and Geldiay 1952, *T. klatti* Numann 1958, *H. (Neotylognathus) kemali* Karaman 1971: Lake Eğirdir.

Material examined: *Thylognathus klatti* 12 specimens in ESFM-PISI/1951-001 Lake Eğirdir (SL: 32.0-38.0 mm); *Hemigrammocapoeta kemali* 2 specimens in ESFM-PISI/1996-009 Aksu Stream, Bağlılı Village, Eğirdir (SL: 51-80 mm); *H. kemali* 18 specimens in SCFK-SDU/0059a Çarşamba Canal, Seydişehir (SL: 33.15-60.43 mm); 13 specimens in SCFK-SDU/0069 Gököl, Dinar (SL: 24.51-54.66 mm); 6 specimens in SCFK-SDU/0124 Bağlılı Village, Eğirdir (SL: 49.30-71.66 mm); 5 specimens in SCFK-SDU/0175 Göynük, Seydişehir (SL: 51.85-63.58 mm); 5 specimens in SCFK-SDU/0229 Yeşildağ, Konya (SL: 46.07-55.77 mm); 13 specimens in SCFK-SDU/247 Lake Işıklı, Çivril (SL: 45.07-60.77 mm); 3 specimens in SCFK-SDU/0232 Tatlıkuyu Canal, Ereğli (SL: 52.33-57.67 mm).

Diagnostic characters: D III 7^{1/2}; A III 5^{1/2}; lateral line 7-17; gill rakers 13-16; scales lateral series 38-46



Figure 2. *H. kemali* SCFK-SDU/0196 Taşağıl Canal, Seydişehir (66.36 mm).

(47); predorsal scales 15-17; pharyngeal teeth 3.3.5-5.3.3.

The first record from Lake Eğirdir was given by Kosswig (1950) as *Thylognathus* (*Neotylognathus*) *klatti*. No observation has been reported since 1958, because it is thought to have been eliminated due to the predatory effect of pike-perch.

***Pseudophoxinus handlirschi* (Pietschmann, 1933)** (Figure 3) (Kavinne)

Acanthorutilus handlirschi Pietschmann 1933, *A. handlirschi* Kosswig and Geldiay 1952, *A. handlirschi* Numann 1958, *A. handlirschi* Ladiges 1960, *Phoxinellus handlirschi* Karaman 1972, *Pseudophoxinus handlirschi* Bogutskaya 1992: Lake Eğirdir; *P. handlirschi* Küçük and İkiz 2004: Köprüçay River.

Material examined: *Acanthorutilus handlirschi* 6 specimens in ESFM-PISI/1950-006 Lake Eğirdir (SL:



Figure 3. *P. cf. handlirschi* SCFK-SDU/0163 Bağlıllı villgae, Eğirdir (79.14 mm).

85-180 mm); *Phoxinellus handlirschi* 7 specimens in ESFM-PISI/1992-026 Aksu Stream, Eğirdir (SL: 69-81 mm); *Phoxinellus handlirschi* 46 specimens in ESFM-PISI/1993-043 Aksu Stream-Pazarköy, Eğirdir (SL: 37-88 mm); *Pseudophoxinus cf. handlirschi* 14 specimens in SCFK-SDU/0163 (SL: 78.15-135.5mm); 9 specimens in SCFK-SDU/0183 Bağlıllı Village, Eğirdir (SL: 35.40-88.35 mm).

Diagnostic characters: D III 7 (8)^{1/2}; A II 6-7^{1/2} lateral line 86-89; scales between dorsal fin origin and lateral line 19-21; scales between pelvic-fin origin and lateral line 5-7; gill rakers 11-13; pharyngeal teeth 5-5.

It is endemic to the lake and its basin. Last fishing with a total of 175 t was carried out in 1960 (Balık et al., 2006). Despite the absence of official records, interviews with former fishermen of the lake suggest its extinction occurred at the beginning of the 1970s.

***Pseudophoxinus egridiri* (Karaman, 1972)** (Figure 4) (Eğirdir minnow, Eğirdir otsazanı)

Pararhodeus niger Kosswig and Geldiay 1952, *Pararhodeus kervillei* Numann 1958, *Phoxinellus egridiri* Karaman 1972, *Pseudophoxinus egridiri* Bogutskaya 1992, *Pseudophoxinus egridiri* Küçük 1998: Lake Eğirdir.

Material examined: *Pararhodeus niger* 1 specimen in ESFM-PISI/1950-007 Lake Eğirdir, (SL: 48.62 mm);



Figure 4. *P. egridiri* SCFK-SDU/0231 Mücevve, Eğirdir (SL: 62.96 mm).

Pararhodeus niger 28 specimens in ESFM-PISI/1951-003 Lake Eğirdir, (SL: 20-44 mm); *Pseudophoxinus egridiri* 1 specimen in SCFK-SDU/ 0231 Mücevve Creek, Eğirdir (SL: 62.43 mm); *Pseudophoxinus egridiri* 4 specimens in SCFK-SDU/0298 Yalvaç Creek (SL: 27.48-35.30 mm).

Diagnostic characters: D III 6-7^{1/2}; A III 6^{1/2}; lateral line 0-3; scales lateral series 43-54; total vertebrae 35-36; gill rakers 9-10; pharyngeal teeth 5-4.

It was first recorded as *Pararhodeus niger* by Kosswig and Geldiay (1952). Later, Karaman (1972) defined it as a new species in genus *Phoxinellus*. *P. egridiri* is differentiated from other species of *Pseudophoxinus* by the number of scales on its lateral line (0-3) and fewer vertebrae (35-36).

***Vimba vimba* (L., 1758)** (Figure 5) (Baltic vimba, Eğrez) *V. vimba* Kosswig and Geldiay 1952, *V. vimba* Numann 1958, *V. v. tenella* Balık 1988, *V. vimba tenella* Küçük 1998, *V. vimba* Balık et al. 2006: Lake Eğirdir.

Material examined: 8 specimens in ESFM-PISI/1950-008 (SL: 84-144 mm); 1 specimen in ESFM-PISI/1994-028 (SL: 276 mm), 5 specimens in SCFK-SDU/0291 (SL: 20.40-25.50 mm).



Figure 5. *V. vimba* SCFK-SDU/ 0291 Lake Eğirdir (SL: 25.50 mm).

Diagnostic characters: D III 8 (9); A III (16)17; lateral line 55-59; scales between dorsal fin origin and lateral line 8-9; scales between pelvic-fin origin and lateral line 4-5; gill rakers 15-17; pharyngeal teeth 5-5.

It was named “Asıl akbalık” in the records of Deveciyan (1915). Partial fishing of the species has occurred; the population decreased during the last decade.

Family: Cobitidae

Cobitis cf. turcica (Figure 6) (Taşısıran)

C. taenia Kosswig and Geldiay 1952, *C. taenia* Numann 1958, *C. simplicispinna* Küçük 1998: Lake Eğirdir; Küçük and İkiz 2004: Kovada Canal, Eğirdir



Figure 6. *C. cf. turcica* SCFK-SDU/ 0100 Kovada Canal, Eğirdir (TL: 84.81 mm).

Material examined: 2 specimens in SCFK-SDU/0100 (SL: 84.81-92.45 mm) Kovada Canal, Eğirdir; 1 specimen in SCFK-SDU/0296 (SL: 67.95 mm) Yalvaç Creek, Eğirdir

Diagnostic characters: D III 7; A III 5; P I 8-9; V I 5-6.

It was defined by Kosswig and Geldiay (1952) as *C. taenia*. Between 1998 and 2007 we were unable to catch any specimens in Lake Eğirdir; however, we did observe a few specimens at the point where Yalvaç Creek connects with the lake.

Family: Balitoridae

***Seminemacheilus ispartensis* Erk'akan, Nalbant and Özeren, 2007** (Figure 7a and b) (Isparta çöpçübalığı)

S. lendlii Balık et al. 2006, *Noemacheilus lendli* Yeğen et al. 2006: Lake Eğirdir.



Figure 7a. *S. ispartensis* SCFK-SDU/ 0277 Beşevler, Eğirdir (TL: 83.53 mm, male).



Figure 7b. *S. ispartensis* SCFK-SDU/ 0271 Çayköy Canal, Eğirdir (TL: 103.92 mm, female).

Material examined: 5 specimens in SCFK-SDU/0271 Çayköy Canal, Eğirdir (SL: 53.82-89.65mm); 5 specimens in SCFK-SDU/0277 Beşevler Spring, Eğirdir (SL: 40.30-80.65 mm).

Diagnostic characters: D III 7; A II 5-6; P I 9-10; V II 5-6; C 16; vertebrae 36.

Its type locality is Beşevler Spring, 5 km from Lake Eğirdir. It is distributed around Lake Eğirdir, in small streams that flow to the lake and in outflow of the lake, Kovada Canal.

***Barbatula mediterraneus* Erk'akan, Nalbant and Özeren, 2007** (Figure 8a and b) (Çöpçü balığı)

Nemacheilus angorae Kosswig and Geldiay 1952, *N. angorae* Numann 1958: Lake Eğirdir; *Nemacheilus angorae* Küçük 1998: Çayköy Canal, Eğirdir.

Material examined: 17 specimens in SCFK-SDU/0103 Çayköy Canal, Eğirdir (SL: 45.89-67.05 mm).

Diagnostic characters: D II 7; A II 5; P I 8-9; V I 6.



Figure 8a. *B. mediterraneus* SCFK-SDU/0103 Çayköy, Eğirdir (TL: 81.05 mm, male).



Figure 8b. *B. mediterraneus* SCFK-SDU/ 0103 Çayköy, Eğirdir (TL: 69.96 mm, female).

A completed lateral line and a notch on the middle of the lower lip. Caudal fin is apparently forked, but tips are not sharp. It shows sexual dimorphism. While pectoral and pelvic fins in males are long with sharp tips, they are short with rounded tips in the female. Type locality is Aksu Stream, which is connected to Lake Eğirdir. It was also observed in Çayköy and Kovada canals.

Family: Cyprinodontidae

Aphanius anatoliae anatoliae (Leidenfrost, 1912) (Figure 9) (Killifish, yosunbalığı)

A. chantrei Kosswig and Geldiay 1952, *A. chantrei* Numann 1958, *A. anatoliae anatoliae* Küçük 1998, *A. anatoliae anatoliae* Wildekamp et al. 1999, *A. anatoliae anatoliae* Balık et al. 2006: Lake Eğirdir.



Figure 9. *A. a. anatoliae* SCFK-SDU/ 0302 Lake Eğirdir (female and male, 33.17-40.89 mm).

Material examined: 8 specimens in SCFK-SDU/0302 Lake Eğirdir, 5 specimens in SCFK-SDU/0307 Kovada Canal, Eğirdir (33.17-40.89 mm).

Diagnostic characters: D II 10-12; A I-II 9-11; V I 5-6; P I 14-16; scales lateral series 29-31; maxillary teeth 13-16; vertical bars (male) 7-8.

It is a native fish of the lake, forming small schools, especially in the littoral zone where submerged plants are dense. The population has instantaneously increased and in 2006-2007 became dominant, together with *A. boyeri*, presumably after the disappearance of the predatory effects of pike-perch in recent years.

Non-native Ichthyofauna of Lake Eğirdir

Family: Percidae

Sander lucioperca (L., 1758) (Pike-perch, Sudak, dişli)

Lucioperca lucioperca Sarihan 1970, *Stizostedion lucioperca* Campbell 1992, *Stizostedion lucioperca* Ekmekçi and Erk'akan 1997, *Sander lucioperca* Küçük 1998, *Sander lucioperca* Balık et al. 2006: Lake Eğirdir.

Diagnostic characters: D1 XIII-XIV; D2 II-III 19-21; A II-III 10-11; L. lat.:83-94; Pyloric caecum 6-7; gill rakers 13-15.

It was introduced to the lake in 1955 by the İstanbul University Hydrobiology Institute after importing 10,000 juveniles of pike-perch from Austria. It adapted well to the lake and was economically caught between 1960 and 2000; however, due to recent negative conditions, such as overhunting, excessive plant growth, and the introduction of *A. boyeri* to the lake, it has become very rare. According to Erk'akan and Bayrak (1992), pike-perch population density has declined significantly due to overfishing and food insufficiency.

Family: Cyprinidae

Carassius gibelio (Bloch, 1782) (Prussian carp, gümüşi havuzbalığı)

C. gibelio Balık et al. 2006, Küçük et al. 2006: Lake Eğirdir.

Material examined: 6 specimens in SCFK-SDU/0280 Lake Eğirdir SL: 86-188 mm).

Diagnostic characters: D III 18-19; A III 16; lateral line 28-31; gill rakers 39-50.

It was first reported in 1996, but it remains unknown how it was introduced to the lake. Nonetheless, it is suggested that they were introduced unintentionally during fish introducing activity. It has become a dominant species and has successfully competed for food and habitat with other Cyprinidae species.

Family: Gobiidae

***Knipowitschia caucasica* (Berg, 1916)** (Figure 10) (Küçük kayabalığı)

Pomatoschistus marmoratus Küçük 1998: Çayköy Canal-Eğirdir; *K. caucasica* Van Neer et al.1999, *K. caucasica* Balık et al. 2006: Lake Eğirdir.



Figure 10. *K. caucasica* SCFK-SDU/0299 Lake Eğirdir (male and female, 37.24-44.66 mm).

Material examined: 11 specimens in SCFK-SDU/0299 Eğirdir lake (37.24-44.66 mm).

Diagnostic characters: D1 VIII; D2 I 8-9; A I 7-9; V 11-12; P I 14-16.

It was first recorded in Çayköy Canal as *P. marmoratus* by Küçük (1998); however, Van Neer et al. (1999) redefined it as *K. caucasica*. There is not enough information concerning whether it is native or non-native in the lake. There is no record related to this species in scientific studies conducted between 1933 and 1997.

Family: Atherinidae

***Atherina boyeri* (Risso, 1810)** (Big scale sand smelt, gümüş balığı)

Atherina boyeri Yeğen et al. 2005, Küçük et al. 2006: Lake Eğirdir

Diagnostic characters: DI VIII; D II 10-12; A II 12-14; scales lateral series 53-54.

It is unknown how this exotic species entered the lake, but it is suspected that it was brought for commercial fishing from another inland water source in Turkey. Today, it is a dominant species of the lake.

Family: Poeciliidae

***Gambusia affinis* (Baird and Girard, 1853)** (Mosquitofish, sivrisinek balığı)

G. affinis Campbell 1992, Küçük 1998, Balık et al. 2006: Lake Eğirdir

Diagnostic characters: D I-II 6-7; A I-II 7-8; scales lateral series 28-32.

It is unknown when it entered the lake and its population density has decreased since 2003. This decrease is thought to have been caused by competition for food with *A. boyeri*, which entered the lake ecosystem in 2003.

Discussion

Except for the non-scientific records of Deveciyan (1915), the ichthyofauna of Lake Eğirdir was determined by Pietschmann (1933), Kosswig (1950), Kosswig and Geldiay (1952), and Karaman (1972). *P. handlirschi* and *P. egridiri* are the only endemics to the lake, while *A. anatoliae anatoliae*, *H. kemali*, *C. pestai*, *S. ispartensis*, and *B. mediterraneus* are the Anatolian endemic taxa.

A. a. anatoliae, which is the oldest member of the fish fauna, was named *A. chantrei* by Kosswig and Geldiay (1952), and in our study this taxon has been called *A. a. anatoliae*, based on the revision by Wildekamp et al. (1999).

C. carpio and *V. vimba*, the indigenous fish of the lake, are the species that are commercially fished. These species, caught in Lake Eğirdir and other lakes (Beyşehir, Akşehir, and Eber Lakes), were an important food source for Sagalassos (Ağlasun-Burdur), the old city of the Roman and early Byzantine era (Van Neer et al., 2000).

Thylognathus (*Neotylognathus*) *klatti* (ESFM-PISI/1951-001), identified in this lake by Kosswig (1950), was determined to be *H. kemali* in the present study. During our field work carried out in the last decade it was determined that its type locality (Akgöl-Ereğli) dried up, but that a small population inhabited Tatlıkuyu Canal (Ereğli), close to this locality. The other habitats of this species are as follows: Çarşamba

Canal, Seydişehir; Kuğu Spring, Seydişehir; Bağlıllı village, Eğirdir (Köprüçay Basin); Gökgöl, Dinar (Büyük Menderes Basin); the source of Lake Işıklı (Büyük Menderes Basin). The extinction of *H.kemali* in Lake Eğirdir is most probably because of the predator effect of pike-perch. Its trace was not detected in the stomach of pike-perch in studies by Sarihan (1970), Campbell (1992), Ekmekci and Erk'akan (1997), or Balık et al. (2002). Although the exact date of its extinction is not known, it is thought to have disappeared before 1970.

C. pestai, whose type locality is Lake Eğirdir, was not caught at all by commercial fishing nets between 1970 and 2003 as a result of the pressure of *S. lucioperca*, but it began to reappear in small numbers after 2003, as this pressure decreased. This species survived because a small creek flowing into the lake forms a shelter and breeding ground. In our observations during the last decade the conservation status (CR) provided by IUCN (The International Union for Conservation of Nature) was determined to be appropriate.

The presence of 2 *Pseudophoxinus* species in the lake is very interesting. These 2 species have adapted themselves to the different habitats of the lake. *P. handlirschi* is a pelagic species of economic importance. Based on interviews with old fishermen, it is thought to have disappeared in the early 1970s. *P. egridiri* is another species of small fish that inhabits only the sources of cold water feeding the lake (Karaot region and Yalvaç Creek). The existence of *P. egridiri* results from the fact that it inhabits the sources that are partly isolated from the lake; however, habitat shrinkage and intensive contamination due to drought in the region over the last decade accelerated the extinction process of this species. During our study period the conservation status (CR) provided by IUCN was determined to be appropriate.

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Although there is insufficient information concerning its origin, *K. caucasica* is thought to be an alien species for the lake. As no record was given in previous studies carried out by various researchers (Pietschmann, 1933; Kosswig and Geldiay, 1952; Sarihan, 1970; Campbell, 1992; Ekmekci and Erk'akan, 1997), and it was not found in pike-perch stomachs, this theory is thought to be valid. The lack of information on this subject was reported Van Neer et al. (1999) and it was reported that this species may have entered the lake inadvertently while stocking it with other fish species.

One of the Cobitidae species was identified as *Cobitis taenia* by Kosswig and Geldiay (1952). In the present study, in consideration of mouth shape and suborbital spin, this Cobitidae species caught in Yalvaç Creek was named *Cobitis cf. turcica*. We determined that the member of Balitoridae, which was previously described as *Nemacheilus angorae* by Kosswig and Geldiay (1952) and Küçük (1998), should be named *B. mediterraneus*.

The type locality of *Seminemacheilus ispartensis* is Beşevler-Eğirdir Spring, which is not linked to Lake Eğirdir. It is assumed that this species may have entered the lake fauna due to longline fishing between 1990 and 1995.

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